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09/788,365	02/21/2001	Tuqiang Ni	015290-517	3359

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Peter K. Skiff
BURNS, DOANE, SWECKER & MATHIS, L.L.P.
P.O. Box 1404
Alexandria, VA 22313-1404

EXAMINER	
ZERVIGON, RUDY	
ART UNIT	PAPER NUMBER
1792	

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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	09/788,365	NI ET AL.	
	Examiner	Art Unit	
	Rudy Zervigon	1792	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *07 February 2008*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *25,28-36 and 38-45* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *25,28-36 and 38-45* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Claim Rejections - 35 USC § 103

1. The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

2. Claims 25, 28-36, and 38-45 are rejected under 35 U.S.C. 103(a) as being unpatentable over Koshimizu; Chishio (US 5,935,373 A) in view of Namose; Isamu (US 5200016 A). Koshimizu teaches a gas injector (156; Figure 1) for supplying process gas to a plasma processing chamber (102; Figure 1) wherein a semiconductor substrate ("W"; Figure 1) is subjected to plasma processing, the gas injector (156; Figure 1) sized to extend through a chamber wall (108; Figure 1) of the processing chamber (102; Figure 1) such that a planar axial distal end (bottom portion of 156; Figure 1) surface of the gas injector (156; Figure 1) body is exposed within the processing chamber (102; Figure 1) – claim 25

Koshimizu further teaches:

i. The gas injector (156; Figure 1) of Claim 25, wherein the gas injector (156; Figure 1) includes a planar axial end face (bottom portion of 156; Figure 1) which is dimensioned so as to be flush with an interior surface of a dielectric window (108; Figure 1) forming the chamber wall (108; Figure 1), as claimed by claim 29

ii. The gas injector (156; Figure 1) of Claim 25, wherein the gas injector (156; Figure 1) body includes a surface (top surface of 156; Figure 1) adapted to overlie an outer surface (top of 108) of the chamber (102; Figure 1), as claimed by claim 33

iii. The gas injector (156; Figure 1) of Claim 25, wherein the gas injector (156; Figure 1) body includes an annular flange (top surface of 156; Figure 1) having a surface (surface

outside of chamber at 156/108 interface; Figure 1) adapted to overlie and contact an outer surface (top of 108) of the chamber wall (108; Figure 1), as claimed by claim 34

iv. A gas injector (156; Figure 1) for supplying process gas to a plasma processing chamber (102; Figure 1) wherein a semiconductor substrate ("W"; Figure 1) is subjected to plasma processing, the gas injector (156; Figure 1) comprising: gas injector (156; Figure 1) body sized to extend through a chamber wall (108; Figure 1) of the processing chamber (102; Figure 1) such that an axial distal end (bottom portion of 156; Figure 1) surface of the gas injector (156; Figure 1) body is exposed within the processing chamber (102; Figure 1) – claim 39

v. a cylindrical bore (coaxial bore in 156; Figure 1) adapted to supply gas to the gas outlet, the cylindrical bore (coaxial bore in 156; Figure 1) being defined by a sidewall and an endwall which extends radially inwardly from the sidewall – claim 39

vi. an annular flange (top surface of 156; Figure 1) adapted to overlie and contact an outer surface of the chamber wall (108; Figure 1) – claim 39

vii. A gas injector (156; Figure 1) for supplying process gas to a plasma processing chamber (102; Figure 1) wherein a semiconductor substrate ("W"; Figure 1) is subjected to plasma processing, the gas injector (156; Figure 1) comprising: a gas injector (156; Figure 1) body sized to extend through a chamber wall (108; Figure 1) of the processing chamber (102; Figure 1) such that an axial distal end (bottom portion of 156; Figure 1) surface of the gas injector (156; Figure 1) body is exposed within the processing chamber (102; Figure 1) – claim 41

viii. wherein the gas injector (156; Figure 1) body includes a uniform diameter central bore (coaxial bore in 156; Figure 1) adapted to supply gas to the gas outlet, the central bore extending axially from an upper axial end face (bottom portion of 156; Figure 1) of the gas injector (156; Figure 1) body, the central bore being defined by a cylindrical sidewall and a flat circular, planar endwall extending between the cylindrical sidewall, inlets of the gas outlets being located on the planar endwall – claim 41

Koshimizu does not teach:

i. the gas injector (156; Figure 1) comprising gas injector (156; Figure 1) body of dielectric material – claim 25

ii. the gas injector (156; Figure 1) body including a bore (coaxial bore in 156; Figure 1) and a plurality of gas outlets in fluid communication with the bore (coaxial bore in 156; Figure 1), the gas outlets adapted to supply process gas into the processing chamber (102; Figure 1), wherein the gas outlets are located in the planar axial distal end (bottom portion of 156; Figure 1) surface of the gas injector (156; Figure 1) body with the total area of the gas outlets less that the cross-sectional area of the bore (coaxial bore in 156; Figure 1) and the gas outlets are sized to inject the process gas at a subsonic, sonic or supersonic velocity - claim 25

iii. The gas injector (156; Figure 1) of Claim 25, the gas outlets include a center gas outlet extending in the axial direction and a plurality of angled gas outlets extending at an acute angle to the axial direction, as claimed by claim 28

iv. The gas injector (156; Figure 1) of Claim 29, wherein the gas injector (156; Figure 1) includes at least one seal adapted to contact the dielectric window (108; Figure 1) when

the gas injector (156; Figure 1) is mounted in the dielectric window (108; Figure 1), as claimed by claim 30

v. The gas injector (156; Figure 1) of Claim 25, wherein the gas outlets include a plurality of angled gas outlets which inject process gas at an acute angle relative to a plane parallel to the distal end (bottom portion of 156; Figure 1) surface, as claimed by claim 31

vi. The gas injector (156; Figure 1) of Claim 25, wherein the gas injector (156; Figure 1) is adapted to be removably mounted in an opening in the chamber wall (108; Figure 1) and includes at least one O-ring providing a vacuum seal between the gas injector (156; Figure 1) and the chamber wall (108; Figure 1),as claimed by claim 32

vii. The gas injector (156; Figure 1) of Claim 25, wherein the gas injector (156; Figure 1) body includes at least one O-ring seal on an outer surface of the gas injector (156; Figure 1) body, as claimed by claim 35

viii. The gas injector (156; Figure 1) of Claim 25, wherein the gas injector (156; Figure 1) body includes a first O-ring seal on an outer surface of the gas injector (156; Figure 1) body and a second O-ring seal in a surface of a flange extending from the outer surface of the gas injector (156; Figure 1) body, as claimed by claim 36

ix. The gas injector (156; Figure 1) of Claim 25, wherein all of the gas outlets supply process gas through the distal end (bottom portion of 156; Figure 1) of the gas injector (156; Figure 1) body, as claimed by claim 38

x. the gas injector (156; Figure 1) body including a plurality of gas outlets adapted to supply process gas into the processing chamber (102; Figure 1) and a cylindrical bore (coaxial bore in 156; Figure 1) adapted to supply gas to the gas outlets, the cylindrical bore

(coaxial bore in 156; Figure 1) being defined by a sidewall and an endwall which extends radially inwardly from the sidewall, the gas outlets including a center gas outlet extending from the endwall in the axial direction and a plurality of angled gas outlets extending from the endwall at an acute angle to the axial direction, wherein the gas outlets are located in the axial distal end (bottom portion of 156; Figure 1) surface of the gas injector (156; Figure 1) body; an annular flange (top surface of 156; Figure 1) adapted to overlie and contact an outer surface of the chamber wall (108; Figure 1) ; and a first O-ring in a surface of the flange for sealing against the outer surface of the chamber wall (108; Figure 1) – claim 39

xi. The gas injector (156; Figure 1) of Claim 39, comprising a second O-ring seal on an outer surface of the gas injector (156; Figure 1) body, as claimed by claim 40

xii. the gas injector (156; Figure 1) body including a plurality of gas outlets adapted to supply process gas into the processing chamber (102; Figure 1), wherein the gas outlets are located in the axial distal end (bottom portion of 156; Figure 1) surface of the gas injector (156; Figure 1) body and the gas outlets being sized to inject the process gas at a subsonic, sonic or supersonic velocity – claim 41

xiii. A gas injector (156; Figure 1) for supplying process gas to a plasma processing chamber (102; Figure 1) wherein a semiconductor substrate ("W"; Figure 1) is subjected to plasma processing, the gas injector (156; Figure 1) comprising a gas injector (156; Figure 1) body made of a dielectric material selected from the group consisting of quartz, alumina and silicon nitride and sized to extend through a chamber wall (108; Figure 1) of the processing chamber (102; Figure 1) such that a planar axial distal end (bottom portion of

156; Figure 1) surface of the gas injector (156; Figure 1) body is exposed within the processing chamber (102; Figure 1), the gas injector (156; Figure 1) body including a plurality of gas outlets adapted to supply process gas into the processing chamber (102; Figure 1), wherein the gas outlets are located in the planar axial distal end (bottom portion of 156; Figure 1) surface of the gas injector (156; Figure 1) body and the gas outlets being sized to inject the process gas at a subsonic, sonic or supersonic velocity, as claimed by claim 42

xiv. The gas injector (156; Figure 1) of Claim 28, wherein the gas injector (156; Figure 1) body includes 8 of the angled gas outlets, as claimed by claim 43

xv. The gas injector (156; Figure 1) of Claim 28, wherein the acute angle is 10 to 70°, as claimed by claim 44

xvi. The gas injector (156; Figure 1) of Claim 28, wherein the angled gas outlets direct the process gas such that the process gas does not flow directly towards a substrate ("W"; Figure 1) being processed, as claimed by claim 45

Namose teaches a semiconductor manufacturing apparatus (Figures 1-3) including plural, angled, outlets (5; Figure 2,3). Specifically Namose teaches a gas injector body (1,4; Figure 3) including a bore (1) and a plurality of gas outlets (5) in fluid communication with the bore, where the gas outlets are adapted to supply process gas into a processing chamber (above 7), and are located in the planar axial distal end surface of the gas injector body (1,4) with the total area of the gas outlets (5) less than the cross-sectional area of the bore (1) assuming Figures 1-3 is reasonably to scale.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to add Namose's plural, angled, outlets (5; Figure 2,3) to Koshimizu's gas injector as taught by Namose, made from process compliant materials and sealed for hemiticity.

Motivation to add Namose's plural, angled, outlets (5; Figure 2,3) to Koshimizu's gas injector as taught by Namose, made from process compliant materials and sealed for hemiticity, is for processing uniformity as taught by Namose (column 3; lines 15-38) and for insulating from Koshimizu's conductive coils as taught by Koshimizu (column 3; lines 40-59).

Response to Arguments

3. Applicant's arguments filed February 7, 2008 have been fully considered but they are not persuasive.

4. Applicant states:

"

Neither Koshimizu nor Namose suggests a gas injector body including a bore and a plurality of gas outlets in fluid communication with the bore, where the gas outlets are adapted to supply process gas into a processing chamber, and are located in the planar axial distal end surface of the gas injector body with the total area of the gas outlets less than the cross-sectional area of the bore. Accordingly, the combination of Koshimizu and Namose does not suggest a gas injector comprising every feature in Claim 25

" (page 10)

And..

"

Moreover, these dependent claims recite additional features that provide additional bases for patentably distinguishing the claimed subject matter over the applied references. For example, Claim 28 recites that "the gas outlets include a center gas outlet extending in the axial direction and a plurality of angled gas outlets extending at an acute angle to the axial direction." Neither Koshimizu nor Namose suggests a gas injector comprising a gas injector body including the combination of gas outlets recited in Claim 28.

"

In response, the Examiner disagrees and specifically cites Namose as teaching a gas injector body (1,4; Figure 3) including a bore (1) and a plurality of angled gas outlets (5) in fluid communication with the bore, where the angled gas outlets are adapted to supply process gas into a processing chamber (above 7), and are located in the planar axial distal end surface of the gas injector body (1,4) with the total area of the angled gas outlets (5) less than the cross-sectional area of the bore (1) assuming Figures 1-3 is reasonably to scale. Compare Namose's Figures 1-3 with Applicant's Figure 3A.

Applicant states:

"

Furthermore, in the absence of any disclosure or suggestion in Koshimizu or Namose of the features of Claim 28, the Examiner did not explain why it would have been obvious to modify Koshimizu's processing gas supply port 156 to result in the gas injector recited in Claim 28.

"

5. In response to applicant's argument that there is no suggestion to combine the references, the examiner recognizes that obviousness can only be established by combining or modifying the

teachings of the prior art to produce the claimed invention where there is some teaching, suggestion, or motivation to do so found either in the references themselves or in the knowledge generally available to one of ordinary skill in the art. See *In re Fine*, 837 F.2d 1071, 5 USPQ2d 1596 (Fed. Cir. 1988) and *In re Jones*, 958 F.2d 347, 21 USPQ2d 1941 (Fed. Cir. 1992). In this case, the Examiner has provided evidence found in the references themselves to suggest the combination. In fact, the Examiner stated that motivation … is for processing uniformity as taught by Namose (column 3; lines 15-38) and for insulating from Koshimizu's conductive coils as taught by Koshimizu (column 3; lines 40-59).

6. Applicant further states with respect to claim 39:

"

The Examiner acknowledges that Koshimizu does not disclose or suggest a gas injector comprising a gas injector body including a plurality of gas outlets adapted to supply process gas into the processing chamber and a cylindrical bore adapted to supply process gas to the gas outlets, the cylindrical bore being defined by a sidewall and an endwall which extends radially inwardly from the sidewall, wherein the gas outlets are located in the axial distal end surface of the gas injector body; or that the processing gas supply port 156 includes a first O-ring in a surface of a flange for sealing against the outer surface of a chamber wall, as recited in Claim 39.

"

In response, Applicant is mistaken. It is clear that Koshimizu's gas injector (156; Figure 1) has clear and unmistakable structural and functional correspondance as compared to Applicant's gas injector at Figure 3A. However, as noted Koshimizu's gas injector (156; Figure 1) does not include the claimed sealing means at Applicant's 50/42 Figure 3A and is also absent additional

amgled outlets. The Examiner thus believes that the prior art in Namose and the level of ordinary skill in the art can and does render the stated differences obvious with motivation found in either Namose for the angled outlets or in the level of ordinary skill in the art concerning the well established desire for hermetic sealing parts to maintain the required high vacuums.

Conclusion

7. Applicant's amendment necessitated the new grounds of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

8. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Examiner Rudy Zervigon whose telephone number is (571) 272-1442. The examiner can normally be reached on a Monday through Thursday schedule from 8am through 7pm. The official fax phone number for the 1792 art unit is (571) 273-8300. Any Inquiry of a general nature or relating to the status of this application or proceeding should be directed to the Chemical and Materials Engineering art unit receptionist at (571) 272-1700. If the examiner

can not be reached please contact the examiner's supervisor, Parviz Hassanzadeh, at (571) 272-1435.

/Rudy Zervigon/

Primary Examiner, Art Unit 1792

Application Number	Application/Control No.	Applicant(s)/Patent under Reexamination	
	09/788,365	NI ET AL.	
	Examiner	Art Unit	
	Rudy Zervigon	1792	